Interfacing Servo Motor with ARM (Firebird V)

Joel M. Pinto and Vishal H. Rajai
eYantra Summer Internship'14
Embedded Real-Time Systems Lab
Indian Institute of Technology, Bombay

IIT Bombay
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Agenda of Discussion

1. Introduction
2. Servo motor
   - Principle and Working
   - Operating Servo Motor
   - Selection of Servo motor
3. ARM7 LPC2148
   - Generating PWM signals
   - Code

Prerequisite knowledge

1. Basic IO Interfacing using ports
2. Working with PWM registers of ARM7 LPC2148.

Introduction

- Servo motors (or servos) are self-contained devices that rotate or push parts of a machine with great precision.
- Servos can put out about 42 oz/in of torque.
- Relatively inexpensive.
- Widely used for educational purpose in mechatronics as they can be controlled by a microcontroller.

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  - gear train
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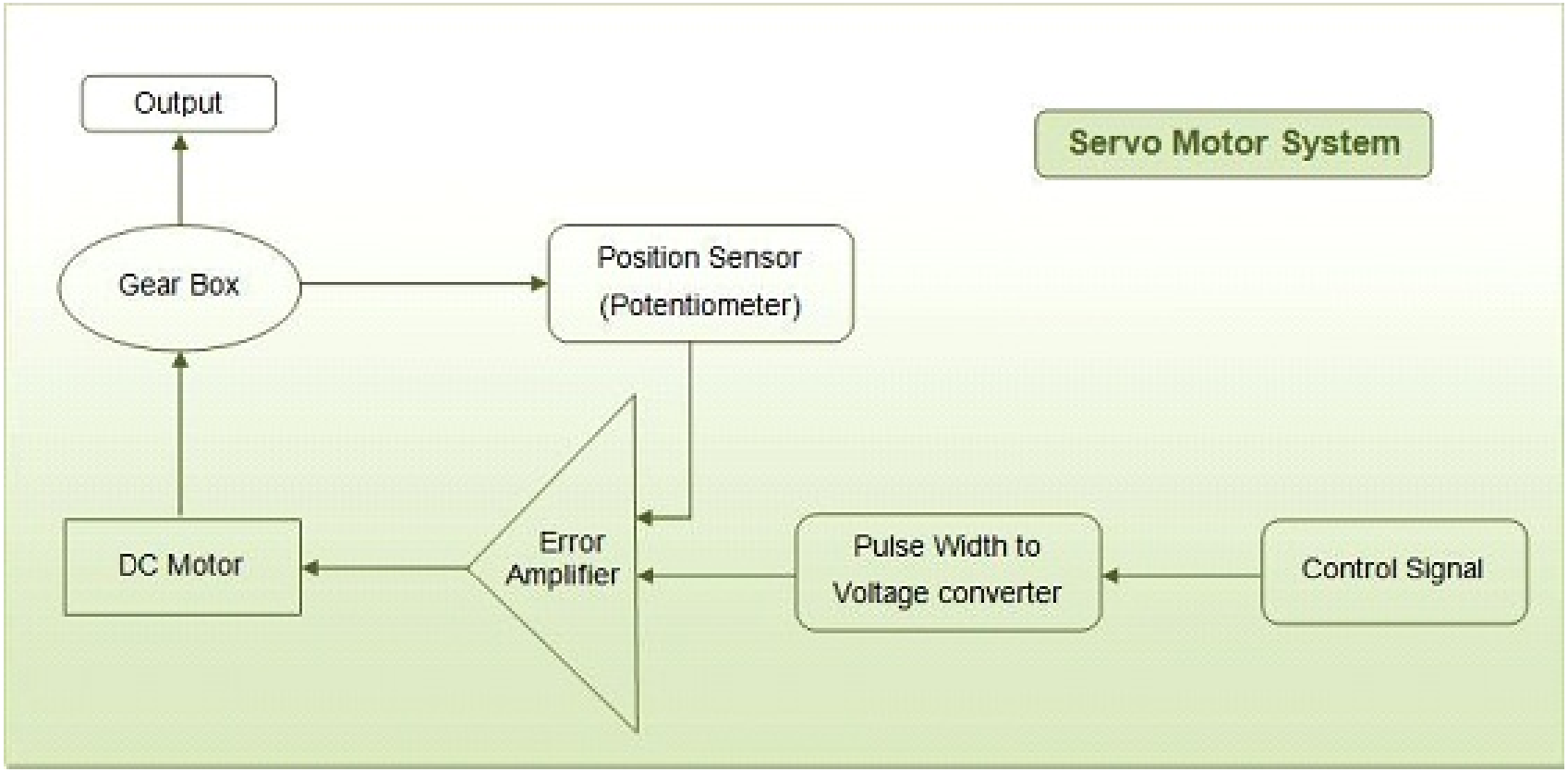
  - control circuitry.
- Forming closed loop control system.


Servo Motor System
Output
Gear Box
Position Sensor
(Potentiometer)
DC Motor
Error
Amplifier
Pulse Width to
Voltage converter
Control Signal

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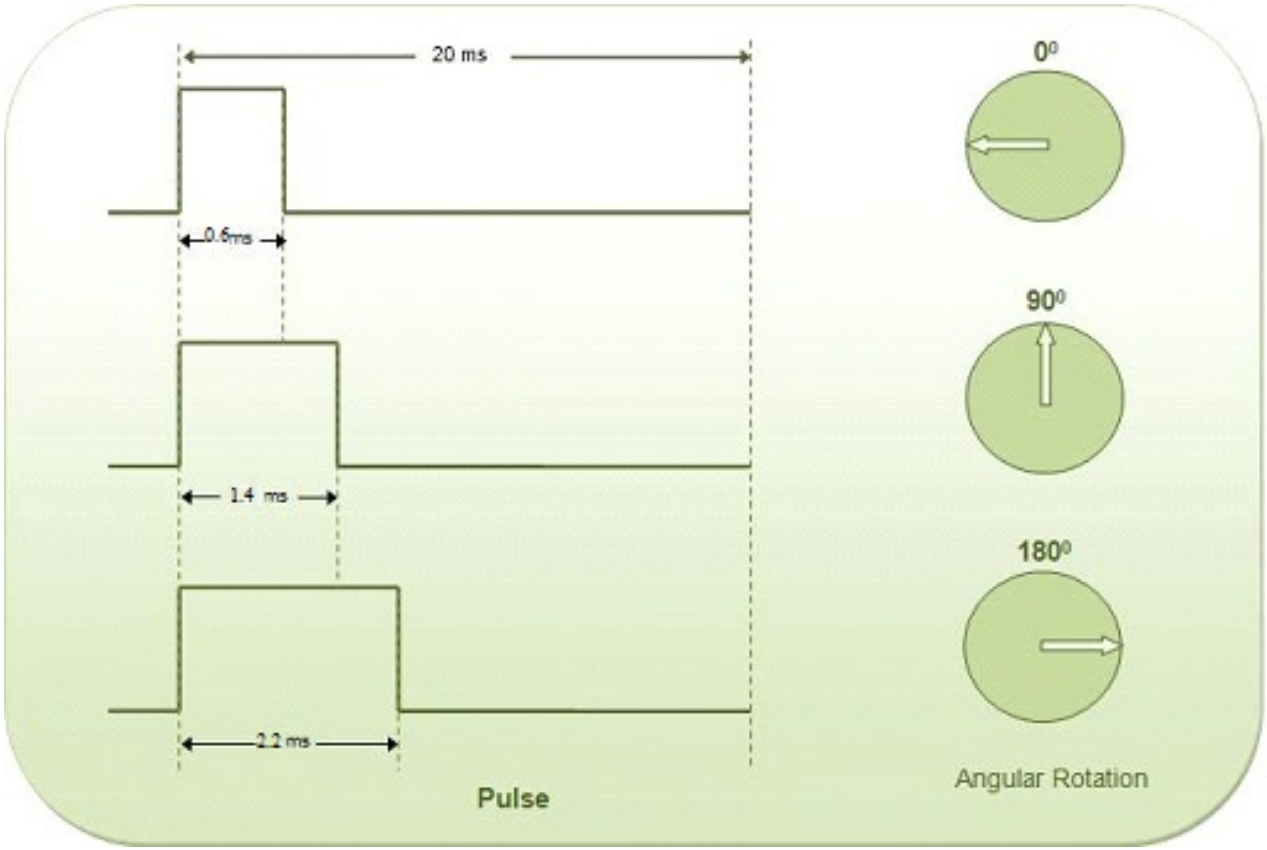
- Resultant signal from error detector acts as input to the dc motor to rotate.
- Also rotating the potentiometer knob coupled with its shaft via gears.
- Reaching desired angle, there would not be any difference in the signals fed to error detector.
- Resulting in motor to stop rotating and wait at that position

Operating servo motor

- 'on-time' of a PWM signal is used as control signal to rotate motor at particular angle.



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- Values of on-time for rotating servo to 0 and 180 degree are provided by the manufacturer in data sheet.
- Graph of on-time period vs. angle is linear.
- Range of PWM frequency for operating servo is 40-60 Hz

Selection of Servo motor

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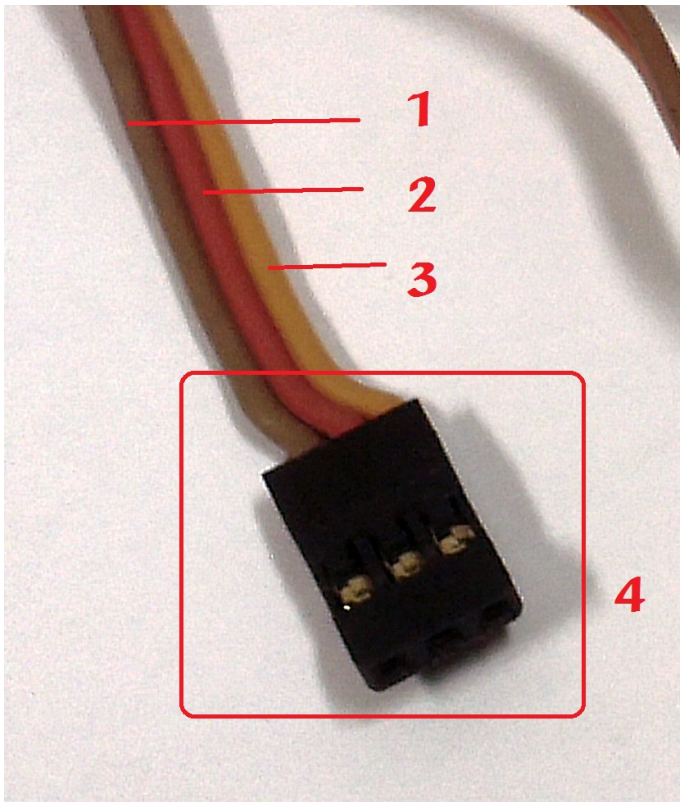
Selection of Servo motor

Servo is selected based on its:

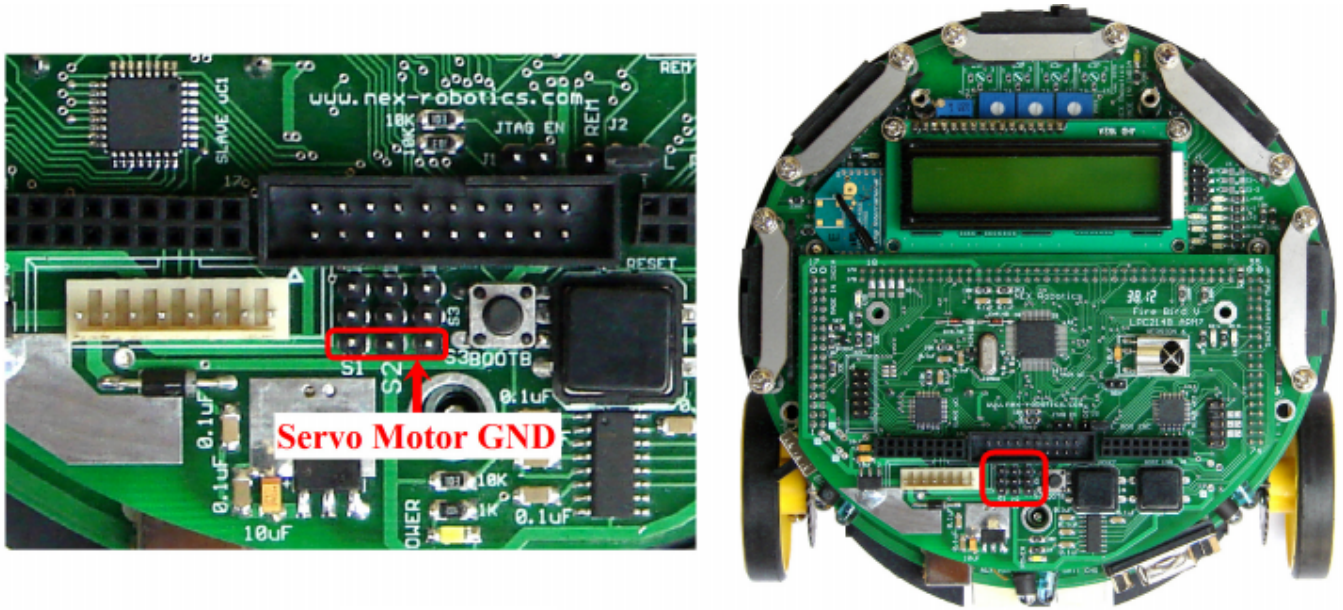
- Torque
- Speed
- Weight
- Dimensions

Servo connector

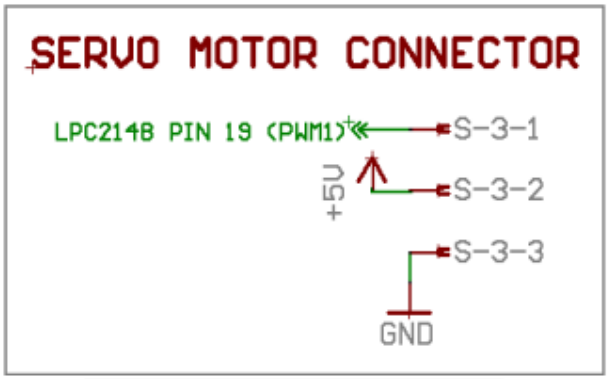


- 1– Ground
- 2– Power
- 3– Control signal
- 4– Connector to controller

Interfacing servo with Firebird V



Servo Connectors location



Servo Connectors Schematic

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Single edged PWM is used here to rotate servo motor.

- Let the Prescaler, PWMPR=120

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- Values of registers like PWMTCR and PINSEL can be found using ARM7 LPC2148 datasheet.

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- As the relation between on-time period and corresponding degree is linear, so is the relation between the count value in PWMMR1 and degree
  That gives,
  $PWMMR1 = (degrees/1.125) + 60.0$

Code
Simple code

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Header files

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```
#include  <lpc214x.h>
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Main Logic

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Simple code

Header files

```
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Main Logic

```
float PositionPanServo = 0;
PositionPanServo = ((float)degrees / 1.125) + 60.0;
UpdateServoPos((unsigned int)PositionPanServo);
```

Thank You!

Post your queries on: helpdesk@e-yantra.org